

OFFICE OF FOSSIL ENERGY

2007 FALL NEWS

ROCKY MOUNTAIN
OILFIELD TESTING
CENTER





MAGNETIC & GAS-SENSING SURVEY

RMOTC COLLABORATES WITH ANOTHER FEDERAL LAB TO PERFORM AIRBORNE SURVEY



The NPR-3 airborne survey team from RMOTC, NETL, Apogee, and Fugro pose for a photo on the test site in August.

PROJECT LEAD: ROGER HALL

RMOTC recently collaborated with the National Energy Technology Laboratory (NETL) to test a novel helicopter-mounted magnetic and gas-sensing survey at NPR-3. Building upon the highly successful survey at the neighboring Salt Creek Oilfield conducted by NETL and Fugro Airborne Surveys, RMOTC contracted with Fugro for the NPR-3 survey that took place in August.

The helicopter flew 60 feet above ground at about 90 mph. Fugro's surveying equipment used aeromagnetics to make an inventory of wells, pipelines, and other oilfield infrastructure at the 10,000-acre site. The system carried two magnetic sensors beneath a

helicopter on two laterally mounted booms.

Sensors on board during the flight also measured methane emissions from various sources including wellheads, pipelines, production facilities, and produced water ponds. Emissions cost the gas industry millions of dollars every year and release millions of cubic feet of methane to the atmosphere.

The RMOTC-funded project produced a comprehensive inventory of exact locations of existing and plugged/abandoned wells and pipelines at NPR-3. It also

assessed the magnetic signatures from cathodically protected infrastructure using the MIDAS horizontal magnetic gradiometer.



The Apogee Leak Detection System unit, owned by NETL, measured methane, total hydrocarbon, and CO₂ emissions from various sources including wellheads, pipelines, production facilities, and produced water ponds.

The test will support the NETL carbon storage program, technology development of leakage detection, as well as future RMOTC tests and test partners.

Since 1999, Fugro has flown thousands of line miles of helicopter magnetic and gas-sensing surveys for the Department of Energy in Wyoming, California, West Virginia, Pennsylvania, Ohio, and Virginia.

FLC AWARD

RMOTC PARTNER RECEIVES AWARD FOR TECHNOLOGY

PROJECT LEAD: BRIAN BLACK

A RMOTC partner, Willowstick Technologies LLC, was honored for excellence in technology transfer by the mid-continent region of the Federal Laboratory Consortium (FLC).

Willowstick's award-winning technology, called AquaTrack, offers the oil and gas industry a cost-effective understanding of the effects of water flood and steam injection activities by efficiently mapping groundwater concentrations.

Willowstick approached RMOTC in October 2004 with the concept of demonstrating its AquaTrack technology at Teapot Dome. The following summer, Willowstick conducted an electromagnetic groundwater survey within the Shannon Sandstone member of the Steele Shale Formation at Naval Petroleum Reserve No. 3 (NPR-3). The survey successfully demonstrated the technology's ability to map and delineate relative formation water concentrations and flow paths associated with water injection activities at NPR-3. Understanding the flow patterns of injected water or steam within a reservoir can provide the information necessary to optimize and better manage secondary oil recovery efforts and can result in reduced operations costs.

"We are flattered to have received this recognition, which is a reflection of many hours of hard work and technology development on the part of our fine staff," said Paul Rollins, Willowstick vice president of business development.

"We are also grateful to RMOTC for its cooperation and support of our technology."

AquaTrack technology provides critical information in a broad range of industries including dam safety, environmental protection, and business operations in the mining and oil and gas industries.

Willowstick was formally honored at the FLC Mid-Continent and Far West fall meetings Sept. 12 in San Diego, Calif. The award was also submitted for a national award along with the winners in the five other regions of the FLC.

ROTARY STEERABLE SYSTEM TESTING

RMOTC SEES SIGNIFICANT INCREASE IN RSS TECHNOLOGY TESTING

PROJECT LEAD: RALPH SCHULTE

Rotary steerable systems (RSS) have exploded onto the drilling scene over the last 10 years. RMOTC is playing an important role in RSS technology development with its real-world testing environment. Over the past several years, RMOTC has seen an upsurge in drilling testing of RSS. Several companies have tested their RSS at RMOTC and returned multiple times to continue developing their technologies. Meanwhile, several other RSS testing partnerships are pending.

The increase in testing of RSS appears to be a direct reflection of trends in worldwide drilling activity and technology development. These trends, along with upgraded equipment at NPR-3, have attributed to the increase in RMOTC's RSS testing role. **RMOTC's**

facilities allow testing partners the opportunity to operate 24/7 during testing, allowing for continuous periods of times to be placed on seals, bearings, motor housing, etc. on an actual drilling rig.

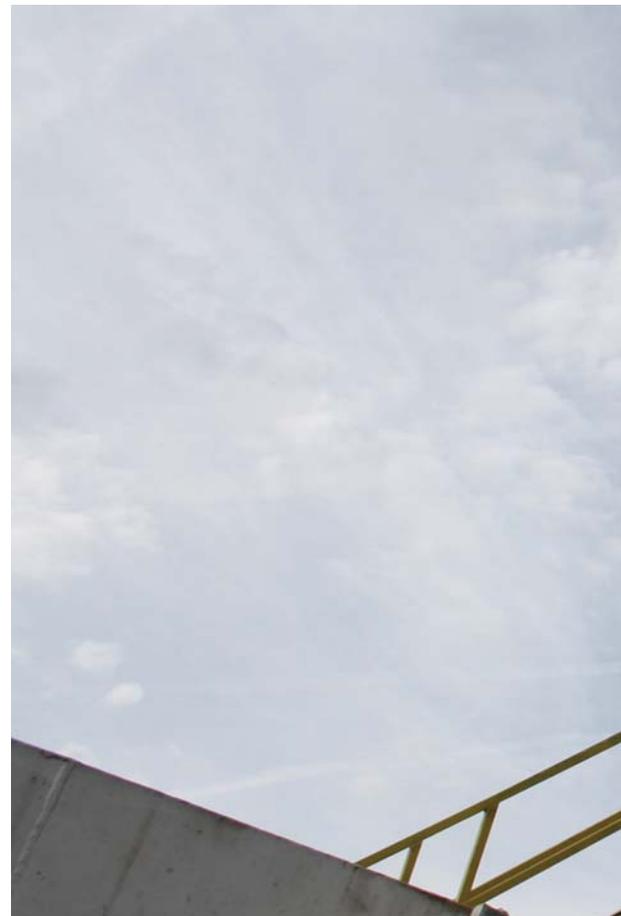
Push-the-Bit and Point-the-Bit

Rotary steerable systems can generally be divided into two major classes: push-the-bit and point-the-bit. RMOTC has tested technology that falls into both classes. Push-the-bit technology involves the use of pads located directly above the drill bit. The pads are normally located on a non-rotating sleeve with the drill string rotating through the sleeve. The pads are individually controlled by down-linking commands from the surface or preprogramming the tool to operate in a certain mode such as build angle, steer, or maintain verticality. This interface between non-rotating and rotating parts involves bearing and seals and has been the focal point in the industry for reliability.

Point-the-bit technology involves deflecting the drill bit internally to aim or point the bit in a particular direction. Three-dimensional controls allow the drilling assembly to build angle, drop angle or turn right or left. The deflection can be accomplished in a number of different ways including mechanical movement of a drive shaft attached to the bit. Eccentric weights can also be used to point the bit. RMOTC has partnered with companies testing both push-the bit and point-the bit technology. One of RMOTC's clients, PathFinder, also has a well-developed system that can be converted from push-the-bit to point-the-bit with the addition of a near bit stabilizer. The near bit stabilizer acts as a fulcrum to point the bit in a certain direction.

RMOTC partners have had varying degrees of success with their-

A RMOTC crew works on the drilling rig during a PathFinder Energy Services RSS test. PathFinder has returned to RMOTC several times for testing.



rotary steerable tests at NPR-3. To date, RSS tests performed have reached total vertical depths as far as 2,100 feet and total measured depths of 3,972 feet.

RSS in the marketplace

So why isn't rotary steerable technology used everywhere in lieu of conventional directional drilling? The answer lies partly in the history of development, organizational structures, and business practices. Large capital investments were made in research and development to bring the first systems to the market. The large capital required made cost recovery a priority and resulted in high rental day rates. The initial generation of tools was also very complex, resulting in high maintenance and support costs.

The rental rates of the first systems were often as high as the day rates of the rigs. The lost-in-hole costs were also higher than the total cost of the well to be drilled. As with most new, advanced technology, costs have decreased with time as the service companies recoup their investments, tools are simplified, and economic

targets are identified.

Conclusion

The RSS industry is still somewhat in its infancy with expanding horizons and applications. **The tools tested at NPR-3 have ranged from prototype to advanced tools as well as technology in between.**

RMOTC's facilities are playing an important role in the development of RSS technology by providing a real-world environment for new and innovative tools to be tested. The possible drilling market for RSS is extensive both onshore and offshore if the technology cost is decreased and reliability improved. Conventional, directional drilling will continue to dominate the lower end of the market as RSS dominates the higher end of the market.

The main beneficiary of the development of low-cost RSS will be in the land-based, mature oilfield market, in particular, onshore U.S. This development will likely continue for a number of years until the systems are designed, fabricated, lab tested and finally, field tested at RMOTC or other similar facilities.



NPR-3 TOUR & OPEN HOUSE

RMOTC PARTNERS WITH STRIPPER WELL CONSORTIUM FOR EVENT



Loren Madden of WhisperGen talks about the company's Stirling Cycle engine being tested at RMOTC during the Open House and field tour held at NPR-3 this summer.

PROJECT LEAD: CONNIE WALLACE

A smoky haze covered NPR-3 as forest fires blazed in northern Wyoming, but a beautiful Wyoming day still managed to greet about 30 guests at NPR-3 in this summer. RMOTC

staff, in conjunction with the Stripper Well Consortium (SWC), organized an Open House and tour of NPR-3 to familiarize people with the facilities and services both organizations offer.

Most guests included RMOTC partners and SWC members. Two representatives from U.S.

Representative Barbara Cubin's

office and Wyoming State Legislature Representative Tom Lockhart also attended.

The tour included stops at several RMOTC and SWC projects currently under way in the field. Several RMOTC facilities were also featured in the half-day tour. Here's a roundup of some of the stops:

Current project stops

One of the first stops on the field tour was at WhisperGen's Stirling Cycle engine project. At the site, a

1-horsepower engine is being used to power a 3-horsepower low-rate, shallow oil well beam unit.

SmithLift's diaphragm pump project was also highlighted. At NPR-3, SmithLift is able to test its pumps under a variety of field conditions to determine real-world performance.

The tour also made a brief stop at NPR-3's biotreatment facility where a new geothermal project will begin in early 2008.

Customer Operations Center

Open House guests were among the first to see RMOTC's new Customer Operations Center. Although the center is not quite finished, it took great strides forward this summer. When it opens next year, three offices will be available for partners' use, as well as a kitchen area and restrooms. High-speed internet access will be available in the offices. The center also features plenty of indoor space to work on equipment.

Rig suites

Conveniently located near the drilling rig, RMOTC's new trailer was delivered to NPR-3 this summer. The trailer houses two suites with small kitchens, living areas, sleeping quarters, and restrooms. The suites are available for partner use.



RMOTC's rig suites can double as a temporary office while the rig is running.

IMPLEMENTATION OF GIS TECHNOLOGY

RMOTC UPGRADES CAPABILITY TO DISPLAY INFORMATION

PROJECT LEAD: BRIAN BLACK

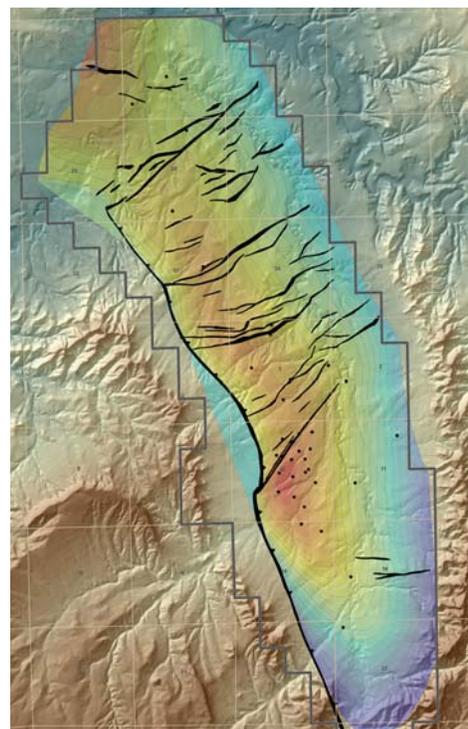
During the past three years, RMOTC has been gathering and consolidating over 80 years of oilfield data and entering that information into a modern geo-computing environment and relational database. A major part of this process includes implementation of a true Geographic Information System (GIS).

Over the past 2 1/2 years, RMOTC has upgraded its GIS capabilities to display facilities, pipelines, well locations, roads, utility lines, remote sensing data, and other features in real-world spatial coordinates. This is a significant upgrade compared to past practices of using drafting software with stand-alone coordinate systems, not spatially referenced, for creating

maps of the field and facilities.

The GIS has allowed RMOTC personnel to display and integrate a large variety of spatial data in ways that were previously not possible. RMOTC uses the GIS to store and display information used in a variety of oilfield applications such as creating basemaps of field infrastructure and facilities, displaying well production data, pipeline leak assessment and flow assurance, environmental monitoring, and tracking oilfield operations.

The data and maps generated by the GIS have been greatly appreciated by RMOTC scientists and engineers as well as RMOTC project partners. Implementation of the GIS has helped RMOTC become the premier oilfield testing and demonstration center in the United States.



Tensleep wells on Tensleep time structure.

WHERE TO SEE RMOTC

CENTER SLATED FOR SEVERAL SPRING TRADESHOWS IN 2008

RMOTC has a busy trade show circuit planned for the spring. RMOTC staff also attend and present at various other conferences throughout the year, so keep your eyes open. Here's a few places you can find RMOTC in the coming months:

IADC/SPE Drilling Conference & Exhibition

March 4-6, 2008

Orlando, Florida

The IADC/SPE Drilling Conference provides an opportunity for producers, contractors, and service company professionals to meet, discuss, evaluate, and share ideas.

RMOTC will exhibit along with about 80 others.

AAPG Annual Convention & Exhibition

April 20-23, 2008

San Antonio, Texas

AAPG is back in Texas in '08 after being held in Long Beach, Calif., in 2007. RMOTC will join about 225 exhibitors in San Antonio. The schedule includes several forums, field trips, and short courses, along with no shortage of entertainment as the city's 10-day FIESTA celebration overlaps the conference.

SPE Improved Oil Recovery Symposium

April 20-23, 2008

Tulsa, Oklahoma

The theme of this year's meeting is "IOR, now more than ever." It reflects the shrinking

base of new field discoveries as well as the mounting number of maturing fields worldwide - and the opportunities and importance attached to those fields. The 16th annual event will feature about 40 exhibitors, including RMOTC.

Offshore Technology Conference

May 5-8, 2008

Houston, Texas

RMOTC will participate in OTC, along with about 2,400 other companies worldwide. In 2007, a record 67,000-plus people attended the conference and exhibition. OTC is the premier offshore industry event for professionals, service industries and suppliers to gather and discuss common issues of ocean resource development.



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RMOTC BRIEFS

Test your technology with real data

RMOTC recently made updates to its three non-proprietary data sets. Well, seismic, and core data sets are available for scientific research, testing and demonstrating software, training end-users, or as an exploration/production analog. Some conditions apply. For more information or to request data, call RMOTC.

RMOTC launches new website, changes URL

Months of hard work and planning have paid off for RMOTC staff as the new website was launched this summer. While many more updates are in the works, the site has a new look and better navigation features.

The site continues to offer a library of RMOTC project reports, links to various

RMOTC publications, information on services and facilities, and much more.

The new website also boasts a new .gov address. RMOTC can now be found on the web at www.rmotc.doe.gov.

2008 DOE-sponsored Wyoming Science Bowl set

High school students from across the state of Wyoming will put on their thinking caps for the 10th Annual Wyoming Regional Science Bowl in February.

The annual event, sponsored by the Department of Energy and RMOTC, is planned and almost fully staffed by RMOTC volunteers.

The winning team will head to Washington, D.C., to compete in the national competition courtesy of the DOE.

